Superior Broadcast LLC

ATSC 3000 Exciter

User Manual

Superior Broadcast LLC

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1 Product Appearance

1.1 Front Panel

LCD:

40×2 LCD with power saving backlight

Reset button:

RST: System reset button

6 Buttons:

Left, Right, Up, Down, OK, Esc (from left to right)

6 LEDs:

LED_TS1: Green light on indicates TS1 is selected and the input TS signal is OK

LED_TS2: Green light on indicates TS2 is selected and the input TS signal is OK

LED_TSErr: Red light on indicates the selected input signal has error (Refer to Chapter 5)

LED_ GPS: Green light on indicates 10 MHz reference signal connected and locked

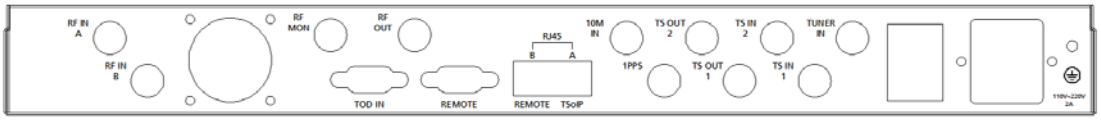
LED_ RFON: Green light on indicates system ready and RF on

LED_ SysErr: Flashing of the red light indicates some system error (Refer to Chapter 5)
Red light on indicates it's in "Local (LCL)" control mode, and red light off indicates it's in "Remote (RMT)" control mode

1 BNC connector:

RFMON: Loop out of feedback signal from port [RF_IN_A] for monitoring

1.2 Back Panel



RF_IN_A: Feedback signal after band-pass filter

RF_IN_B: Feedback signal before band-pass filter

RF_MON: Loop out of [RF_OUT] for monitoring

RF_OUT: RF signal output

TOD_IN (RS232): Reserved

REMOTE (RS232): Serial port for remote control

REMOTE (RJ45-B): 10M/100M Ethernet for remote control

TSoIP (RJ45-A): Reserved

10M_IN: 10 MHz input from external GPS receiver

1PPS: 1 PPS input from external GPS receiver

TS_IN_1: The first input for TS signal, ASI only

TS_OUT_1: Loop out of [TS_IN_1] for monitoring

TS_IN_2: The second input for TS signal, ASI only

TS_OUT_2: Loop out of [TS_IN_2] for monitoring

2 Operation Specifications

- Environment
  - Operating Temperature: -10 ~ 50 °C
  - Operating Humidity: ≤ 95%
  - Atmospheric Pressure: 86 kPa ~ 106 kPa
- Power Supply
  - Voltage: 88 ~ 264 VAC
  - Frequency: 50 / 60 Hz
- Inputs/Outputs
  - RF_IN_A /RF_IN_B
    - Connector: BNC female
    - Impedance: 50 Ω
    - Level: -30 dBm ~ 0 dBm
      Recommended range: -15 dBm ~ -5 dBm
    - Location: Back Panel
  - RF_OUT
    - Connector: N-type female
    - Impedance: 50 Ω
    - Level: -25 dBm ~ +5 dBm
    - VSWR: > 15 dB
    - Location: Back Panel
  - RF_MON (loop out of [RF_OUT])
    - Connector: BNC female
    - Impedance: 50 Ω
    - Level: -25 dB below [RF_OUT]'s output level
    - Location: Back Panel
  - 10M_IN
    - Connector: BNC female
    - Impedance: 50 Ω
    - Level: AC-coupled, $V_{P-P} \geq 300$ mV
    - Location: Back Panel
  - 1PPS (input)
    - Connector: BNC female
    - Impedance: 50 Ω
    - Level: 3.3 V-TTL
    - Input trigger: Positive Transition
    - Location: Back Panel
  - TS_IN_1/ TS_IN_2
    - Connector: BNC female
    - Impedance: 75 Ω
    - Level: See Table 1

- ◆ Location: Back Panel

■ TS_OUT_1/ TS_OUT_2

- ◆ Connector: BNC female
- ◆ Impedance: 75 Ω
- ◆ Location: Back Panel

■ RF_MON FEEDBACK (loop out of [RF_IN_A])

- ◆ Connector: BNC female
- ◆ Impedance: 50 Ω
- ◆ Level: -11 dB below [RF_IN_A]'s output level
- ◆ Location: Front Panel

Table 1 ASI Input Specifications

No	Content	Unit	Value
1	Input Level	mv	≥ 200
2	Positive Transition (20%~80%)	ps	≤ 1200
3	Negative Transition (20%~80%)	ps	≤ 1200
4	Deterministic Jitter	%	≤ 10
5	Random Jitter	%	≤ 8

Note

1) The interface electrical characteristics are measured under normal condition. Otherwise the values may change.
2) Operating under abnormal circumstances may cause dysfunction of the exciter. Long operating hours under severe environment may reduce the reliability of the entire system, which even causes permanent damage to electronic components. Ensure all interface electrical characteristics or environment parameters are within the defined range listed above before any operation.

3 Menu

3.1 Initialization

Connect power supply then turn on the exciter. The initialization process takes about 5 seconds to finish while RF output level increases gradually to the pre-set value.

3.2 Query Mode

Query mode is a mode which displays parameters and status of exciter. There are three pages in query mode. Press "Right" or "Left" button to switch between different pages which are shown from Table 2 to Table 4 as below.

Note: All the displayed settings or numbers in below tables are for illustration only and may be different from those in actual use.

Table 2 the First Page in Query Mode

TSNR	LID	UID
38.5	43.5	44.0

Table 3 the Second Page in Query Mode

INPUT	STA	TS_RATE	TEMP
TS1	OK	19.392816 Mbps	104.90°F

Table 4 the Third Page in Query Mode

FREQ	AGC	GPS	1PPS	CTRL	ADPC
683M	OFF	LOCK	OK	RMT	OFF

Note:

1) The "TSNR", "LID" and "UID" in Table 2 are the measurement of feedback signal quality. This feedback signal could be from a transmitter or the exciter itself and its input range is from -30 dBm to 0 dBm (Recommended range is -15 dBm to -5 dBm). Feedback signal is required to be connected port [RF_IN_A] ONLY. If there is no signal connected, these readings will not be available or not valid. The "TSNR" is measured with equalization on. It takes about 10 seconds to get the first reading on "TSNR", and about 3 seconds to get the first reading of "LID" and "UID". After averaging, the "TSNR" display upper limit is shown at about 39 dB and those of IMD are shown at about 54 dB.
2) The "CTRL" status in Table 4 has "RMT" (Remote) mode and "LCA" (Local) mode. When in "Local" mode, the exciter can only be controlled by the front panel interface and when in "Remote" mode, settings from the front panel keyboard are ignored - with the exception of "RMT"/"LCA" setting, and only commands from remote control interface, such as serial port or WEB, are processed.

3.3 Control Mode

Control mode is a mode to specify settings of exciter. To switch to control mode, press ***both***

"Left" and "Right" buttons ***at the same time*** in query mode. Main menu in control mode is shown in Table 5.

Table 5 Main Menu in Control Mode

Welcome to setting interface!			
*SYSTEM	RF	MODE	CONFIG

Main menu consists of 4 sub-menus: SYSTEM, RF, MODE and CONFIG.

When on main menu in control mode, press "Left" or "Right" button to move the cursor and press "OK" button to enter the target sub-menu. When in the corresponding sub-menu, press "Left" or "Right" button to move the cursor to the target parameter and then press "Up" or "Down" button to select options from the drop-down boxes. ***Press "OK" button to save, or press "ESC" button to skip the changes and return to upper menu.***

All the parameters of sub-menus are shown from Table 6 to Table 9 respectively.

Table 6 System Menu in Control Mode

	CTL	ADPC	RST
Default	RMT	OFF	NO
Options	RMT	OFF	NO
	LCA	UPDATE	YES
		HOLD	

Note:

1) The "CTL" (Control) setting has two options, "RMT" (Remote) and "LCA" (Local). The exciter can be switched between these two modes only via the front panel interface. When in "LCL" mode, the exciter can only be controlled by the front panel interface and all commands from serial port or WEB are ignored. When in "RMT" mode, settings from the front panel keyboard are ignored - with the exception of "RMT"/"LCA" setting, and only commands from remote control interface, such as serial port or WEB, are processed. The default value of "CTL" after "RST" is "RMT". Notice that LED "SysErr" remains on all the time in "LCA" mode, so only when it is flashing means there is some system error.
2) The "ADPC" parameter in "SYSTEM" sub-menu has options of "UPDATE", "HOLD" and "OFF". If option "OFF" is selected, the ADPC function will be turned off. If option "HOLD" is selected, it will ***restore*** the last time stored ADPC data instead of restarting a new ADPC process. If feedback signal are connected properly and option "UPDATE" is selected, it will start a complete ADPC function, including ***both the linear and non-linear*** pre-correction to the entire transmission system including the distortion of both transmitter and band-pass filter. Refer to Chapter 4 for detailed information.
3) The "RST" parameter in "SYSTEM" sub-menu has options "YES" and "NO". There will be a check page out to confirm the operation in order to avoid any mistake happening. If option "YES" on the check page is selected, the system will restore all default settings. This may lead to the ***change of exciter's output level*** (the default value is ***0 dBm*** after reset). To prevent any potential damage, disconnect all other device when the exciter is going to be reset.

Table 7 RF Menu in Control Mode

	*RF	FREQ	Hz	POWER	AGC
Default	ON	707M	+00000	+0.00	OFF
Options	ON	473M	-50000	-25.00	OFF
	OFF	479M	-49999	-24.95	ON
		485M	-49998	-24.90	
		...	...	...	
		...	...	...	
		...	...	...	
		875M	+49998	+4.90	
		881M	+49999	+4.95	
		887M	+50000	+5.00	

Note:

1) The "Hz" parameter in "FREQ" sub-menu is the direct adjustment of the frequency of RF output signal. The range is -50,000 Hz to +50,000 Hz, with steps of 1 Hz. This feature is designed for up to 50 kHz spectrum shift as ATSC standard required, or adjustment of the output frequency for carrier accuracy.
2) The "AGC" parameter in "RF" sub-menu has options "ON" and "OFF". If option "ON" is selected, the AGC function will be turned on. This function ensures a stable output level of exciter even under the variation of working temperature or mismatch impedance, and its adjustable range is from +1 dB to -10 dB. If AGC function is turned on, it is not suggested to change other settings of the exciter, such as output level or channel. Only use the AGC function when the exciter or the entire transmitting system has been stable.

Table 8 MODE Sub-menu in Control Mode

8VSB

Table 9 CONFIG Menu in Control Mode

	*ID	bps	IP	GATEWAY	MASK	UPGRADE
Default	ID: 80H	19200	192.168.001.143	192.168.001.001	255.255.255.000	NO
Options	ID: 80H	19200	***.***.***.***	***.***.***.***	***.***.***.***	NO
	ID: 00H	9600				YES
	...	38400				
	ID: FEH					
	ID: FFH					

Note:

1) "UPGRADE" is a mode to upgrade the firmware of micro controller. It's only available for advanced users. If there is any misoperation, restart the exciter to cancel the upgrade process.
2) "IP", "GATEWAY", and "MASK" are used to establish a valid Ethernet connection for remote control via RJ45. The exciter has a built-in WEB GUI which requires only a standard web browser run by a PC. Simply by entering specified IP address, which is setup in CONFIG sub-menu, in a browser's address bar, the login interface will pop up and give user prompts to input user name and password. Both the default user name and password are "admin" (case sensitive). The "admin" account only allows users to retrieve information such as SNR and shoulder measurements, user configuration, and alarms. Only some basic settings such as RF switch, Power, are accessible in "admin" account. To get a full control of the exciter, please log in with the root account, whose user name and password are "user" and "ANWP" (case sensitive).

4 Connection

4.1 Connect the Transmitter

- Don't turn on or off the exciter when the transmitter is running. The correct order is:
  - First of all turn on the exciter.
  - Measure the RF output level of the exciter to make sure it meets the requirement of the transmitter input level. If the output level is out of range, change the parameter "POWER" in "RF" sub-menu in control mode to make the adjustments. Refer to Table 7, Chapter 3 for details. If the output signal level is within range, connect the exciter's output (port [RF_OUT] on back panel) to the transmitter's input.
  - After the exciter is stable, turn on the transmitter.
  - Likewise, turn off the transmitter first before making any change to the exciter's settings. Restart the transmitter after the exciter is stable again.

4.2 Start ADPC function

- After the exciter is connected to a transmitter, first of all measure the level of the transmitter's output (both ***before and after*** band-pass filter). Make sure it meets the requirement of exciter's feedback level (-30 dBm ~ 0 dBm and recommended range is -15 dBm to -5 dBm).
  - If the signal level is out of range, use extra devices, e.g. attenuator, to make adjustments.
  - If the signal level is within the range, connect the transmitter's output which is ***before*** band-pass filter to port [RF_IN_B] and another output which is ***after*** band-pass filter to port [RF_IN_A] respectively. Figure 1 below demonstrates the correct connection.
- Start ADPC function
  - Select option "UPDATE" on "ADPC" of SYSTEM sub-menu in control mode. Save the change, then all 3 parts of the ADPC process starts automatically in sequence, with tips ("Wait a moment...") and readings of "TSNR", "LID" and "UID" shown on LCD. Usually it takes about 10 minutes to finish the total compensation of both ***the linear and non-linear*** distortion in the whole transmission system including both power amplifier and band-pass filter. Following each part, there is a "Saving" process which takes from seconds to minutes to save necessary ADPC data into the on-board memory.
  - Readings of "TSNR", "LID" and "UID" provide a continuous measurement and display of quality of feedback signal during the ADPC process. Compare these readings before and after the ADPC process as the reference of compensation performance. Restart or abort the ADPC progress if compensation doesn't bring up a better signal quality.
  - There is a "Loading" process if the exciter is turned on again or "HOLD" option is selected. It mainly ***restores*** the ADPC data saved last time when an entire ADPC process has been run successfully.

Note:

1) To monitor the entire process, connect the output of [RF_MON FEEDBACK] which is on front panel) to equipment for measurement. The level of [RF_MON FEEDBACK] is about 11 dB lower than the feedback signal which is connected to port [RF_IN_A].
2) Do not change the connection status during the ADPC process otherwise it may affect the

performance.

3) If any abnormal situation occurs during the ADPC process, the system will bypass all the pre-correction data immediately and leave the corresponding tips on LCD. Press any key to cancel the ADPC function manually and restart the ADPC function again after the problems are resolved. Refer to Chapter 5 for further information.

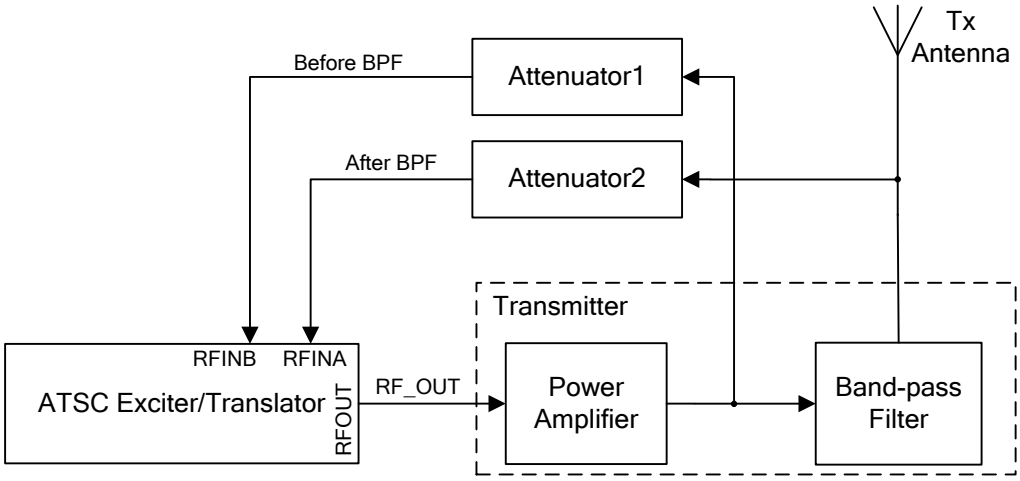


Figure 1 Connection with Transmitter of UPDATE Function

5 Troubleshooting

5.1 Input

- TS1 ERROR
  - Alarm message
    - LCD: TS1 ERR
    - LED_ TS1: Off
    - LED_ TSErr: On
  - Cause: Input signal from port [TS_IN_1] is lost or has invalid format.
  - Solution: Check connection of port [TS_IN_1], and make sure input signal has valid format.
- TS2 ERROR
  - Alarm message
    - LCD: TS2 ERROR
    - LED_ TS2: Off
    - LED_ TSErr: On
  - Cause: Input signal from port [TS_IN_2] is lost or has invalid format.
  - Solution: Check connection of port [TS_IN_2], and make sure input signal has valid format.
- Transport Stream Rate Overflow or Underflow
  - Alarm message
    - LCD: TS_RATE Overflow
  - Cause: The input TS bit rate is higher than the bit rate required
  - Solution: Adjust the TS input bit rate. Or connect all devices with the same reference clock (GPS).

  Note:

  The exciter has bit rate auto-adaptation function to deal with the bit rate mismatch. It will automatically delete null packets or insert null packets when necessary to achieve the accurate acquired bit rate.

5.2 ADPC

- Feedback Signal Level
  - Alarm message
    - LCD: " FEEDBACK TOO BIG! Press Any key to Esc"
      Or " FEEDBACK TOO SMALL! Press Any key to Esc"
    - LED_ SysErr: Flashing (during the ADPC process)
  - Cause: Feedback signal level is too high or too low.
  - Solution: Cancel the ADPC function manually and then adjust the input level of the feedback signal according to the messages on the LCD. Start the ADPC function again after the problem is resolved.

  Note:

  The acceptable range of feedback signal from port [RF_IN_A] or [RF_IN_B] is -30

dBm to 0 dBm, and the recommended range is from -15 dBm to -5 dBm.

- Feedback Signal Connection Error
  - Alarm message
    - LCD: FEEDBACK LINK ERROR! Press Any key to Esc
    - LED_ SysErr: Flashing (during the ADPC process)
  - Cause: Feedback signal connection is interrupted, or signal level changes dramatically during the ADPC process.
  - Solution: Cancel the ADPC function manually and then check the connection and the level of the feedback signal. Start the ADPC function again after the problem is resolved.
- ADPC Error
  - Alarm message
    - LCD: ADPC ERROR! Press Any key to Esc
    - LED_ SysErr: ON (during ADPC process)
  - Cause: The ADPC process goes wrong.
  - Solution: Cancel the ADPC function manually and then check the product status. Start the ADPC function again after the problem is resolved.

5.3 Other Problems

- Temperature
  - Alarm message
    - LCD: TEMP HIGH
    - LED_ SysErr: ON
  - Cause: The Temperature of the exciter is too high.
  - Solution: Cool the exciter.
- No RF output
  - Alarm message
    - LCD: None
    - LED_ RFON: Off
  - Cause: RF output can be turned off via front panel or serial port or WEB interface. Or if the exciter has a breakdown, there would be no RF output too.
  - Solution: Check the setting of "RF" via front panel, serial port or WEB interface. Restart the exciter if necessary. If the problem still exists, contact the manufacturer for further solution.

Note:

If "Slow ON/OFF" function is turned on (user configurable in advanced settings), during power changing process, LED_RFON may be flashing.

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